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Volume II, No. 3

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INTRODUCTION TO MATHEMATICAL STATISTICS

by **PAUL G. HOEL**, Associate Professor of Mathematics,
University of California at Los Angeles

Throughout this book emphasis is placed on the functional aspects of mathematical statistics. Many illustrative examples of both numerical and theoretical types make this book highly satisfactory for the industrial statistician.

This introduction to classical large-sample and modern small-sample methods includes such topics as the following: frequency distributions of one, two, and more than two variables; large-sample and small-sample theory; testing

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"It covers the ground with a minimum of waste and yet points out clearly the limitations of the various procedures."

—E. L. Bartleson, *Chairman of the Joint Examination Committee of the Actuarial Society and the American Institute of Actuaries.*

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This book demonstrates the advantages of using sequential analysis to test statistical hypotheses. For instance, it shows how to use the sequential probability ratio test which controls the possible errors by wrong decision as effectively as the best procedure based on a predetermined number of observations. Yet, it reduces the observations necessary.

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"The book is written in the author's usual completely lucid manner. It is highly recommended to all who wish to learn about sequential tests of hypotheses."

—A. M. Mood in *Mathematical Reviews*

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work, the choice of sample size, precautions in taking samples, and the organization of a statistical quality control program.

The basic function of a control chart is to find those faults and errors that are controllable but not controlled. The book describes how this can be done, the purposes and techniques of inspection, the terminology of control chart

"Perhaps the best feature of Mr. Rice's book is his discussion of how control charts may be geared into the perennial factory effort to determine and maintain the most economical costs of manufacturing its products."

—A. V. Feigenbaum in *General Electric Review*

1947 6 by 9 1/4 149 pages \$2.50

These volumes are part of the Wiley Mathematical Statistics Series, edited by Walter A. Shewhart

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The American STATISTICIAN

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STATISTICAL BLACKOUT

The continuing attempt of the Economic and Social Council of the United Nations to present the status and estimate the prospects of the world economy is being severely hampered by the failure of the Soviet Government to provide the data necessary for an understanding of economic conditions in the U.S.S.R. Members of the Council have been concerned with the absence of information on the Soviet Union in the *Economic Report* prepared by the Secretariat. This lacuna was described by Professor Arutiunian, the Soviet representative, as 'a glaring defect' which made the report 'not a survey of the world economy in the true sense of the word.'

To rectify this situation. Dr. Arutiunian delivered an official account of the progress of post-war rehabilitation and economic development in the Soviet Union at the February-March meeting of the council. His statement contains a great deal of scattered information from which certain estimates of the course of the Soviet economy can laboriously be inferred. The statistics were given in ratio form, but the actual data of the base period remained undisclosed. For example, the Soviet representative stated that industrial output in the U.S.S.R. rose by 32 percent in 1947 as compared with 1946, textile production by 33 percent and the average money wage of workers by 38 percent.

These figures are of little significance if the data for 1946 are considered state secrets. As measures of economic progress, they are obviously defective. The extent to which the large gains in industrial output during 1947 were merely the result of bringing idle or slightly damaged capacity back into play can only be conjectured. Even the movement of real wages between 1946 and 1947 is unknown.

The usefulness of the sessions of the Council on economic statistics must remain in doubt so long as data are presented for the polemical purpose of proving the superiority of the Soviet system over capitalist society. A great deal of Professor Arutiunian's statement was devoted to invidious comparisons of the progress made by the two systems in postwar reconstruction. The published Soviet data are obviously insufficient for a valid comparison. In any event the purpose of gathering world economic statistics in the United Nations is supposedly to enable competent specialists to have the raw material necessary for constructive work, rather than to provide subject matter for political harangue.

For reasons which are not entirely clear, the Soviet Union has applied a policy of non-disclosure toward the basic data of its economy more rigorous than that resorted to elsewhere in wartime. As a result, world comparisons and trends in output, capacity, agricultural activity, productivity, living standards and national income and wealth levels remain incomplete. No comprehensive compilation of Soviet economic statistics has appeared for ten years.

The determined refusal of the Soviet Union to supply statistical information essential to an understanding of its economic conditions has resulted in the development in this country of a small corps of experts on Soviet economy. These men combine economic and statistical competence with detective ability and a highly developed imagination. They must draw their conclusions concerning the Soviet economy as a whole from the apparent slips and inconsistencies in official Soviet data. This is hardly the basis for true understanding.

THE EDITORS

NEWS

Merrill M. Flood elected ASA Secretary-Treasurer—180th Annual Meeting papers invited—ASA to nominate District Representatives to new Council—IMS September meeting—Survey of Federal Statistics—Navy needs Scientists

Survey of Federal Statistical Agencies

The National Bureau of Economic Research is undertaking a survey of the statistical agencies of the United States Government. The survey is being made for the Hoover Commission on the Organization of the Executive Branch of the Government, and is expected to be completed in about six months. An advisory panel of statisticians acquainted with the special problems faced in the collection and analysis of statistics in various subject matter fields will work with Frederick C. Mills and Clarence D. Long of the Research Staff of the National Bureau in the conduct of the study.

In broad terms, the purpose of the survey will be "to examine and appraise the statistical agencies with regard to the scope and quality of their work and the effectiveness of their administration. Attention will be paid to problems of coordination, to any overlapping or duplication of functions that may exist, and to possible gaps in coverage. The services rendered by statistical agencies will be appraised with reference to their cost to taxpayers, the burden on those providing the original data, and the needs of a modern state for statistical information to be used for administrative and other purposes of public importance."

Dr. Mills and Dr. Long have begun a series of conferences in statistical agencies on problems involved in the survey.

World economic reports

The first of a series of "Economic Reports" planned by the Department of Economic Affairs of the United Nations has been issued under the sub-title, "Salient Features of the World Economic Situation, 1945-47."

The series is intended to meet the need for an appraisal of world economic conditions and trends to be made from time to time as a prerequisite for recommendations upon concerted national or international action in the economic field, David Owen, Assistant UN Secretary-General in charge of economic affairs, says in a preface.

Part I surveys the world economy and several of its outstanding problems. Part II is concerned with regional economic conditions. Part III contains discussions of some outstanding world economic problems. Part IV, which reports on international action in the economic field, concludes with a chronology including events of major economic significance from the surrender of Germany

in May 1945, to the close of the UN General Assembly in November 1947.

An editorial note concludes: "A word may be said regarding the scanty data upon which some of the studies presented have been based. Although there has been a steady recovery in statistical services since the end of the war, there is still lost ground to be made up and in many cases much further progress needs to be made if any thorough economic analysis is to be attempted. This paucity of data has handicapped some of the studies here presented."

The work includes 110 tables, rounding up statistical data which for the most part has been previously published in widely scattered sources by governmental and private agencies, and five pages of charts. It is available from International Documents Service, Columbia University Press, New York 27, at \$2.50.

Institute of Mathematical Statistics schedules Wisconsin Meeting

The thirty-fifth meeting and eleventh summer meeting of the Institute of Mathematical Statistics will be held at Madison, Wisconsin, in conjunction with the American Mathematical Society and the Mathematical Association of America on September 7-10, 1948. Information about this meeting may be obtained from Secretary P. S. Dwyer, Ann Arbor, Michigan.

Columbia School of Engineering Training Conference on Industrial Experimentation

The School of Engineering of Columbia University in the City of New York announces an Intersession Five-day Intensive Training Conference on Industrial Experimentation to be offered September 14-18, 1948, by the Department of Industrial Engineering in cooperation with the Department of Mathematical Statistics of the Graduate Faculty of Political Science.

The lecturing will be shared by Professors S. B. Littauer and J. Wolfowitz and a staff of special lecturers drawn from industry.

A descriptive brochure will be ready for mailing in the latter part of July. For further details interested persons may communicate directly with Professor S. B. Littauer, Department of Industrial Engineering, Columbia University, New York 27, New York.

MERRILL M. FLOOD ELECTED SECRETARY-TREASURER OF THE AMERICAN STATISTICAL ASSOCIATION

The Board of Directors of the American Statistical Association announces the election of Merrill M. Flood as Secretary-Treasurer of the Association. He succeeds Lester S. Kellogg who resigned to accept an executive position with Deere and Company.

Dr. Flood has been engaged for the past twelve years in research and consultation on applications of higher mathematics and statistics to problems of scientific research and development, public administration, and business management. He served for four years before the war as economics advisor to the governor of West Virginia. For six years prior to that time he instructed in mathematics at the University of Nebraska and at Princeton University.

As a Research Associate on the faculty of Princeton University from 1936 until shortly after the close of the war, Dr. Flood was in charge of a number of research projects and was Director of the Applied Mathematics Group at Princeton during the war. After the war he served the War Department as Scientific Adviser to the Director of Research and Development Division of the War Department General Staff. His time is now divided between his new ASA duties and his research and consultation activities. Dr. Flood is the author of numerous research reports and papers in mathematics, statistics, economics, public administration, and war science.



MERRILL M. FLOOD

Societies holding annual meetings in Cleveland December 27 to 30, 1948

American Economic Association	Dec. 28-29
American Farm Economic Association	Dec. 28-30
American Marketing Association	Dec. 27-29
American Statistical Association	Dec. 27-29
Econometric Society	Dec. 27-29
Institute of Mathematical Statistics	Dec. 27-29

Survey Research Center expands

The University of Michigan has announced that the Research Center for Group Dynamics, now at Massachusetts Institute of Technology, will be affiliated with the University's Survey Research Center beginning July 1.

Group Dynamics' chief function is to learn more about the forces which control human behavior in groups and to develop a deeper understanding and permit a more intelligent management of human problems. Since its establishment at

M.I.T. in 1945, under the leadership of the late Kurt Lewin, Group Dynamics has conducted research on problems of the loyalty of individuals to groups, minority problems, group conflicts, and also studies on how ideas and attitudes are communicated to various kinds of groups.

Group Dynamics will be associated with the University's Survey Research Center in an enlarged program, which will be directed by Dr. Rensis Likert, now head of the Survey Research Center. Dr. Angus Campbell will be in general charge of Survey Research and Dr. Dorwin Cartwright, who now heads Group Dynamics, will continue to direct it.

In addition to Dr. Cartwright, other members of the Group Dynamics staff will be Dr. Ronald Lippitt, Dr. John R. P. French, Jr., and Dr. Leon Festinger. All will carry teaching assignments in the social sciences in addition to their research.

It is also a training unit for graduate students interested in industrial relations, public health, government and other kinds of group work.

108th Annual Meeting of the AMERICAN STATISTICAL ASSOCIATION

December 27-29, 1948, Hotel Statler, Cleveland, Ohio

The program for the Annual Meeting of the American Statistical Association next December, is planned around six "feature" papers and three "review sessions". Each Fellow of the Association has been asked to nominate at least six speakers, with proposed topics from which the principal papers may be selected.

The Program Committee now asks the help of the entire membership in searching out the ablest speakers and the best topics for our program. Aryness Joy Wickens, with the assistance of a small working committee, will sift all of the suggestions and select the six speakers who may be expected to give the most interesting papers.

The "review" sessions will treat three areas of major interest to the statistician:

Statistical Resources
Statistical Methodology
Mathematical Statistics

Each of these sessions will be devoted to a review of recent advances, a discussion of important needs, and a forecast of probable results to be achieved in the near future—"what-have-we-just-done-and-where-should-we-go-next-sessions".

One paper in the session on Statistical Resources will be concerned with non-technical matters of interest to the statistical profession, such as: legislation, volume of activity, organization, financial support, personnel, and professional standards. The other paper will discuss developments of technical aids for the statistician, such as: high-speed computers, numerical tables, technical publications, and compilations of data. The two papers together, and discussion from the floor, should do much to help the membership organize to meet common professional needs.

The two papers in the session on Statistical Methodology will not include any material that is especially mathematical or of primary interest in only one subject-matter field.

All information now available about the program is outlined on these pages for your information. Send your nominations or other suggestions to the Program Committee at the Office of the American Statistical Association, 1603 K Street, N. W., Washington 6, D. C. as promptly as possible. All suggestions should be in by the end of July so that all speakers may be selected and sessions completed before the end of August.

Merrill M. Flood, Chairman
Program Committee

PRELIMINARY PROGRAM

The names of the responsible organizers are given after each session

The final program will appear in the October issue of *The American Statistician*

MONDAY—DECEMBER 27, 1948

10 A. M.—NOON

Marketing I, Joint With American Marketing Association—D. R. G. Cowan
Feature I—Aryness Joy Wickens

Mathematical Statistics I, Joint with Institute of Mathematical Statistics

Population, Joint with Population Association of America

Psychology, Joint with Biometric Society—Joseph Zubin

NOON-4 P. M.

Quality Control, Joint with American Society for Quality Control

LUNCHEON

—Paul E. Olmstead

2-4 P. M.

Review of Statistical Resources—Frederick F. Stephan

Review of Mathematical Statistics, Joint with Institute of Mathematical Statistics, Econometric Society, Biometric Society—Churchill Eisenhart

Social Insurance—Mortimer Spiegelman

Medical Statistics, Joint with Biometric Society—James A. Rafferty

4-6 P. M.

Sample Surveys I—Rensis Likert

	Business Statistics I—John H. Cover
	Mathematical Statistics II, Joint with Institute of Mathematical Statistics
	Directors Meeting I—President
8-10 P. M.	Teaching I—Joseph E. Morton
	Special Topics I—A. F. Hinrichs
	Editorial Boards

TUESDAY, DECEMBER 28, 1948

8-10 A. M.	District Representatives Breakfast—Secretary-Treasurer
10 A. M.-NOON	Marketing II, Joint with American Marketing Association—D. R. G. Cowan
	Business Statistics II—John H. Cover
	Feature II—Aryness Joy Wickens
	Teaching II—Joseph E. Morton
	Public Health, Joint with Biometric Society, American Public Health Association —Hugo Muench, Jr.
	Economics I, Joint with American Economic Association, Econometric Society —Frank R. Garfield.
NOON-2 P. M.	Business Statistics (Business Meeting)—John H. Cover
LUNCHEONS	Census Enumeration Areas—Howard W. Green
	Teaching (Business Meeting)—W. Allen Wallis
2-4 P. M.	Review of Statistical Methodology—John W. Tukey
	Mathematical Statistics III, Joint with Institute of Mathematical Statistics
4-6 P. M.	Graphic Presentation—Kenneth W. Haemer
	Special Topics II—A. F. Hinrichs
	Mathematical Statistics VI, Joint with Institute of Mathematical Statistics
	Biometrics I, Joint with Biometric Society—H. W. Norton
	Econometrics—T. Koopmans
7-10 P. M.	ASA Dinner and Business Meeting

WEDNESDAY, DECEMBER 29, 1948

10 A. M.-NOON	Economics II, Joint with American Economic Association—Frank R. Garfield
	Farm Economics I, Joint with American Farm Economic Association —Harry R. Wellman
	Feature III—Aryness Joy Wickens
	Mathematical Statistics V, Joint with Institute of Mathematical Statistics
	Biometrics II, Joint with Biometric Society—H. W. Norton
NOON-4 P. M.	Outlook for 1949—Donald S. Thompson
LUNCHEON	
2-4 P. M.	Farm Economics II, Joint with American Farm Economic Association —Harry R. Wellman
	Sample Surveys II—Rensis Likert

4-6 P. M.

Mathematical Statistics VI, Joint with Institute of Mathematical Statistics
Biometrics III, Joint with Biometric Society—H. W. Norton
Agricultural Statistics—Charles F. Sarle
Special Topics III—A. F. Hinrichs
Mathematical Statistics VII, Joint with Institute of Mathematical Statistics
Biometrics (Business Meeting)—J. H. Watkins
Directors II

PREPARATION OF PAPERS

Anyone wishing to contribute papers should get in touch with A. Ford Hinrichs at the office of the Secretary before September 1.

Summaries or abstracts of all papers must be submitted before October in order that they may be reproduced. They will be used for advance publicity and will be available in advance to members attending the Cleveland sessions.

PLANS FOR A NEW SECTION ON BUSINESS STATISTICS

Many members of the Association who are concerned with business statistics have indicated their desire for a special section devoted to their interests. If enough members respond, it is hoped that a definite proposal for the formation of a new section will be submitted at the business meeting in Cleveland. All members interested in the formation of such a section should get in touch with John H. Cover, at the School of Business, University of Maryland, and give him their suggestions.

Nominations for District Representatives on the ASA Council Due September 15th

According to the provisions of the new Constitution of the Association, nominations for District Representative on the ASA Council must be received in the Office of the Secretary-Treasurer by August 1. The Board of Directors has divided the Association into the six Districts listed below. Each member of the Association is entitled to nominate one candidate for District Representative from his District. There will be no other nominations.

By November 15, the Office of the Secretary-Treasurer will mail ballots to the membership, containing the names of the four candidates in each District having the largest number of nominations together with a brief biographical sketch of each candidate. The membership in each District will elect two candidates, the ballots to be received by the Secretary-Treasurer not later than December 15.

Most of the membership is enrolled in Chapters and hence will have no difficulty in determining the Districts in which to vote. Other members must decide in which of the six Districts their professional interests lie and so indicate on the ballots which they will receive.

Since this is the first election under the new Constitution, two Representatives will be chosen from each District. One of them will serve only

one year and will be considered the senior Representative of his District. As such, he will be Chairman of the District Committee during 1949. He will be succeeded as Chairman in 1950 by the 1949 Junior Representative, whose tenure as District Representative will be two years. In subsequent years, only one Representative will be elected from each District and will serve for two years.

Northeastern District

1. Albany
2. Boston
3. Connecticut

Eastern District

1. Central New Jersey
2. Harrisburg
3. Ithaca
4. New York
5. Philadelphia

Southeastern District

1. Asociacion Cubana de Estadistica
2. North Carolina
3. Washington Statistical Society

North Central District

1. Central Indiana
2. Chicago
3. Cincinnati
4. Cleveland
5. Columbus
6. Detroit
7. Madison, Wisconsin
8. University of Illinois

South Central District

1. Austin
2. Oklahoma City
3. St. Louis

Western District

1. Denver
2. Hawaii
3. Los Angeles
4. Pacific Northwest
5. Sacramento Statistical Association
6. San Francisco

Authority and Reason as Instruments of Coordination in the United States

by **MORRIS A. COPELAND**

Board of Governors of the Federal Reserve System

We depend very largely today on the Federal Government to provide the over-all social and economic measurements which should reveal the operations of the various aspects of our society. Our society is an organic whole; the Federal Government is, to some extent, a divided personality. In particular, the task of providing economic and other social measurements is divided among a large number of Government agencies. It is clear that if our social and economic measurements are to be adequate, either for policy purposes, or for analysis pursued for its own sake, the various measurements must articulate with each other. We must have a balanced coverage, not a wealth of information about one aspect of our society, and little or nothing about another. Again, when we have some major components of a significant total, we need also to know the total. Further, when two series measure related factors, the movement of the ratio between them must reflect a real social or economic change, not incomparabilities in the two series. Above all, statistical pronouncements must not contradict each other.

On the Merits of a Decentralized System

Can we hope from an agency division of statistical labor to get a coordinated picture of our economy and our society?

It has sometimes been suggested that we could solve the problem of coordinating our statistical information by consolidating all Federal statistical compilation in a single agency. I doubt the wisdom of such a proposal. When the work of collecting and compiling statistics is largely divorced from the work of analyzing them, it is usually bad for the statistics. It may even be bad for the statistics if one agency collects the basic reports and another does the compiling. To be a good compiler of figures, you need to know how they were collected and (what is more important) you need to know what they are good for.

But it would be impossible to have a close association of collectors, compilers and analysts if all compilation were carried on in one central agency. The great bulk of our statistics is basically a by-product of administrative reports; and most administrative reports will have to continue to be collected by the agencies vested with

the several administrative responsibilities that give rise to these reports. Tax forms will presumably continue to be collected by tax collectors, etc.

The work of social and economic analysis also will necessarily continue to be distributed among a large number of agencies. When economic analysis is needed as an aid to economic policy it is practically essential to locate the analysis in the agency which has the policy responsibility. Thus, work in bank credit economics needs to be located near those responsible for bank credit policy.

These considerations should make it clear that, if all statistical compilations were made in a single central agency, there would be an ill-advised divorce of statistical compilation and analysis. And incidentally, many important economic series would necessarily remain outside the consolidation, e.g. cash income from farm marketings. There would also be a divorce of the collection of statistical forms from the compilation of the information on them—a divorce that would create numerous difficulties in the resulting figures.

Nor is this all. Economists have often stated a law known as the "law of the size of the firm." This law assumes that when an enterprise passes a given size, its efficiency of operation decreases. I think this law applies with peculiar force to an intellectual operation such as the compilation and analysis of social and economic statistics. Diminishing efficiency sets in at an early stage. As the size of a statistical and economic or social research unit increases, it very soon develops mental compartments; it also tends to become set in its way. A good working organization unit devoted to statistical compilation and analysis is almost necessarily a small one.

There is another objection to solving the problem of statistical coordination by a general consolidation. It does not get at the basic difficulty. Statistical coordination means getting people to work together intellectually. For this purpose, good will is a necessary condition, but it is not sufficient. The basic need is for intelligent leadership, for leadership which understands and will point in some detail the paths to be followed. Mere consolidation of agencies does nothing to provide such leadership. It does not even assure us good will. Consolidation of government agencies cannot be counted

on to improve the intellects of government officials; quite possibly it will not improve their dispositions.

I recall some years ago participating in negotiations which eventuated in the consolidation of two machine tabulating units. The consolidation was duly carried out in form; the personnel of the two constituent units were made responsible to a single officer. A year later, I had occasion to inquire into the situation and discovered that the two constituent units were still operating as separate entities. They were as remote physically (space assignments had not been changed) as before the consolidation. They were also as distant intellectually.

If we are to continue our decentralized system of Federal statistical services, as I think we should (and as I think we are likely to in any case), we ought to face certain broad questions. We ought to face the question of how under such an arrangement to provide a coordinated and well-balanced system of reports; how to get a new series when one is needed; how to make sure that an urgently needed improvement is made; how to eliminate contradictions when they arise; how to provide for comparability between related series compiled by separate agencies; how to provide for discontinuing work of relatively slight consequence, when funds are more urgently needed for other purposes.

Statutory powers cannot compel one to be wise

If we reject the idea of a general consolidation, a plausible alternative suggests itself. Should we not have a central authority to settle jurisdictional disputes, to direct the discontinuance of some series and the establishment of others, and to direct that needed improvements in series be adopted? If such an agency is to be effective, its orders must be implemented. For full implementation it would need to be able to impound unneeded funds and to make allocations from a statistical reserve fund to finance its affirmative directives; it would need also to be in a position to dismiss an officer responsible for a given statistical operation when he proves incompetent or recalcitrant, and to see that competent people are hired.

In my opinion, such a central authority is also an effective and an impossible solution. In the first place, the implementation I have suggested would mean combining for the statistical services the powers of the Division of Estimates of the Bureau of the Budget with those of the Civil Service Commission, and it would mean delegating to this central authority discretion which the Congress now regards as part of its appropriating power. We are not likely to see such a concentration of authority.

We might, of course, have a single central authority with less extensive powers than those I have suggested. But, unfortunately, it is far easier to clothe such an

agency with restrictive powers than it is to provide implementation for its affirmative directives. Yet for purposes of a good over-all statistical picture of our society, it is vastly more important to confer on such an agency the power to get things done than it is to give such an agency the power to hamper or to stop a statistical activity.

Even if a central agency could be given adequate legal authority to get things done, I think such an arrangement would be very unwise. The attribute of statistical work which is most important for purposes of getting a coordinated picture of our society is that such work calls for intelligence. Among the obstacles which impede the making of needed improvements in social and economic information the two principal ones are: (1) Those who should make the improvements do not know what series it is important to create; they cannot visualize a "statistic" we do not yet have, or cannot understand how it will be used. (2) Those who should make the improvements cannot see how to get along with the materials at hand; they are blocked by technical difficulties they do not know how to overcome. A central authority with ample power to direct and inadequate intelligence would not remove either obstacle. Such an agency could do a great deal of harm and probably would not do a great deal of good. On the other hand, a central agency which understands what information is really needed, how it will be used, and how it can be got from existing basic data, can bring about many improvements. Even if it has no power but the prestige which attaches to an important status in the Federal organization chart, it can accomplish a great deal, nearly as much in fact as it could with greater legal powers.

Let me indicate two dangers that I see in vesting an agency with mandatory powers to improve statistics:

1. Such an agency is likely to yield to the temptation to emphasize its prerogatives as a policeman; to devote a major part of its energies to prescribing rules, to interpreting them in particular cases and to searching out infractions and invoking whatever sanctions may be at its disposal. Policing is not conducive to the development of interagency goodwill. It is a poor substitute for the provision of intellectual leadership with a true sense of values and an ability to help find the way around technical obstacles. But the temptation to make such a substitution is strong.
2. An agency which operates largely in terms of rules and sanctions is likely to get bogged down in a mass of unimportant details.

Review Must be Discriminating

Something can be done toward improving our statistical information and toward coordinating the statistical

end-products of various agencies through a review of statistical questionnaires. The Division of Statistical Standards has attempted to serve this objective and at the same time to serve the objective of saving respondents unnecessary burdens in making out report forms. But the two objectives are not entirely compatible. Many proposed questionnaires that are potentially burdensome promise little in the way of valuable data. From the point of view of improving our over-all social and economic information, there are probably at least ninety-nine questionnaires to be reviewed which are of negligible importance to one questionnaire that is really important. But there is no sharp line between important questionnaires and unimportant questionnaires. Hence, it would be difficult to manage a questionnaire review service in such a way that most of the energies would go into the one percent of really important questionnaires and a negligible part of the staff energies would go into the ninety-nine per cent that are of negligible importance. Moreover, consideration for respondents' burdens militates against a highly discriminating review of this sort. I like to call this type of administration problem the conflict between democracy and the "jay-shaped" distribution. A frequency distribution of questionnaires by social and economic significance is decidedly "jay-shaped"; the least significant are by far the most frequent. But it is difficult to prevent a review staff from regarding all questionnaires as nearly equal before the law. An agency which does not succeed in discriminating ruthlessly between the significant and the insignificant will almost certainly have too little staff energy left for providing intellectual leadership.

What intelligent leadership can do

I have attempted to contrast administrative authority and intellectual leadership as instruments for improving our statistical picture of the operations of our society, and I have urged that intellectual leadership is far more likely to produce good results. I do not mean to say that the obstacles in the way of improved information are always and exclusively intellectual obstacles. Sometimes the trouble is lack of funds; sometimes it is a jurisdictional dispute; sometimes it is bureaucratic cupidity; sometimes sheer official incompetence. The Division of Statistical Standards has done a good deal to provide us with a remedy for such administrative difficulties. I shall presently indicate a direction in which I think it can do more. But first I should like to consider the techniques of intellectual leadership more fully.

If you know clearly some piece of social or economic information which is needed, know why it is needed, and know how it can be got technically, what can you do to put the idea into effect? There is first the direct

approach. You can sell the importance of your idea to the proper official and tactfully demonstrate its feasibility. To some extent you should be able to select the most likely customer. This may be the man immediately in charge, the man to whom he reports, or possibly the Secretary. But if you go over a man's head, you must not give him cause to fear you have criticized him before his superior—if you expect to have his good-will. After the sale, you will be dealing with the man immediately in charge. When technical obstacles to carrying out the idea are encountered, you must stand ready to be helpful to him in finding the way around them. I would underscore the word "helpful." It would be unwise condescendingly to tell him the way around. If you have made a sale of the idea, the title to it must pass. It must become the idea of the man who is to carry it out. It must cease to be your idea. Your customer must have the credit for the improvement.

You may not make a sale the first time you try it. But this should not stop you. You should have learned how to improve your proposition. In any case provide your prospect with a rationalization for changing his mind. Revamp your proposition thoroughly, rechristen it, and try again.

There is a great advantage in the method of direct salesmanship, particularly when the job involved is comparable to that of developing an index of production, or, let us say, construction. If the man who is to do the job does not fully understand it and its implications for social and economic analysis, if he has not made the idea his own, if he is merely undertaking to comply with a directive, his intention may be compliance, but the result may be nearly worthless.

There are other methods beside direct salesmanship, other intellectual methods. There are always various possibilities of indirect salesmanship, of selling your idea to someone else who can help your cause. I will stop for only one illustration. If it is difficult to persuade a responsible official that he ought to follow an approved line of statistical action, when he seems bent on some other line, it sometimes pays to build a bonfire under him. This means selling your idea to a number of third parties. You must know your Washington to know what third parties you can carry along with you and what third parties can help your objective most. Also, you can burn your fingers on such a bonfire.

Still other methods are available for intellectual leadership, methods that are less spectacular and much slower, but they are methods which nonetheless should accomplish much in the longer run.

One such device which a leadership agency has at its disposal is a very simple one—the power to ask

questions. Just asking the right question of the right person at the right time will often help materially to bring about a reform in statistical operations. Very little in the way of authority is needed for this purpose. But to ask the psychologically right question, one must have a well thought out and highly selective program of statistical development, and one must be able to stick to it. Repeated doses of this kind of medicine are likely to be needed. To change the metaphor, the process is one of erosion. Physiographic erosion is directed by the force of gravity; intellectual erosion needs a similar consistency of direction, if a definite pattern is to be achieved.

Statistical cross fertilization

Another important contribution that an agency in a position to give intelligent leadership can make is almost as simple as asking questions: the mere getting of people together to talk over common and related problems is important. If such a policy is followed systematically and wisely it helps to keep each agency informed of related developments taking place in other agencies. And it promotes good-will, mutual understanding, and the cross-fertilization of ideas. This device can be supplemented by printed aids. Thus, the Division of Statistical Standards has developed through a system of representative committees and has promulgated several standard schemes of classification. It has also provided the *Statistical Reporter* and the *Federal Statistical Directory*.

An agency in a position to get people together can help to overcome the evil called "layering". For example: Mr. A reports to Mr. B who reports to Mr. C. Through channels Mr. A cannot speak to Mr. C. Mr. X, in another agency, may be able to talk to both Mr. A and Mr. C, and even to bring them together.

The Division of Statistical Standards does not possess authority in respect to personnel, but it can exert and has exerted an important influence toward the improvement of standards for professional social science personnel. This is a broad subject and I shall content myself with having called attention to it.

In the bringing of people together and in the encouragement of improved standards for professional personnel, the Division of Statistical Standards has been making an important contribution, a much more important one than has been generally realized.

Who can lead

I have spoken of a leadership agency. This is, I think, misleading. No agency has, or can have, a monopoly of the kind of leadership I have been talking about. The Division of Statistical Standards has an important responsibility in this respect and has done much to en-

courage statistical improvements, but it is by no means the only agency in a position to contribute intellectual leadership.

Indeed, there are other agencies that have an advantage the Division of Statistical Standards does not enjoy—the advantage of a professional staff actively engaged in a broad program of substantive analysis and research. In this respect the Council of Economic Advisers is in a particularly strategic situation. Although it is a recent addition to the family of federal agencies it has already come to exert a very significant influence toward a better statistical picture of economic conditions and this influence seems destined to increase. Again, an agency such as the National Income Division in the Bureau of Foreign and Domestic Commerce necessarily has a wide grasp of statistical sources, and a keen appreciation of urgent statistical needs. It has furnished important leadership and should continue to do so. Further, the unit in the Bureau of the Census responsible for the *Statistical Abstract* has the point of view of the consumer of statistical compilations and is in a position to look at the statistical services broadly and critically. Especially in recent years it has helped to promote better statistics. We may fairly hope that its leadership functions will continue to grow. There are many other agencies to which we may look for leadership in the development of our statistical information. In fact, private individuals as well as Government agencies can make their contributions; any one who has an idea for statistical improvement to sell may undertake to sell it.

Centralizing responsibility within each field

I have urged that our Federal statistical organization should continue to be decentralized. I do not mean that it should remain unchanged. In its First Annual Report, the Central Statistical Board, predecessor of the Division of Statistical Standards, outlined a plan of organization for the statistical services. It suggested that there should be a focal agency having centralized responsibility for statistical information pertaining to each major aspect of our society. It suggested also that, in many cases, this focal agency should be one primary collecting agency for reports coming from a given industry or group of industries to the Federal Government. In other words, it proposed no over-all consolidation, but a development of as much centralization in each segment of the social and economic field as would be compatible with existing assignments of administrative responsibilities.

The advantages of such a plan should be obvious. Far more in the way of the bringing of related functions together in one unit can be realized by this plan than by a single over-all consolidation. But the segmentalized consolidations can retain the advantages of small-scale

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Criminal Comparisons

by PAUL WIERS
Bureau of the Budget

Washington, D. C. had a thriving crime wave last spring—on paper. According to statistics reported in Uniform Crime Reports for the first half of 1947, robbery increased 52%, burglary 109%, and aggravated assault 250% over the preceding year. All this after the city had enjoyed a past reputation—again on paper—for a normal crime rate among cities of comparable size.

This situation illustrates the difficulties encountered in making comparisons of crime statistics. There may have been a change in the trend of crime in Washington during early 1947, but its direction and extent were obscured by changes in methods of reporting used by the police. In past years a considerable number of cases were omitted from the official statistics for one reason or another.

During 1947 as the result of a series of articles in the Washington Post, reporting methods were changed. Most if not all offenses discovered by or reported to the police were included. Thus comparisons of 1947 with earlier years show large percentage increases. But they are "statistical" rather than "real" increases. Similarly, city by city comparisons of crime are subject to many statistical pitfalls because of differences in local definitions, classifications and reporting procedures.

Systematic reporting begins

Systematic reporting of crime statistics in the United States on a national scale dates back to 1930. In that year at the request of the International Association of Chiefs of Police, the Federal Bureau of Investigation began the collection of voluntary monthly and annual reports from local police and sheriffs. The program is largely handled by correspondence although a field staff is available to assist in the design and installation of reporting systems. Results are published semi-annually in "Uniform Crime Report." Data collected include: (1) offenses known or reported to the police (2) unfounded complaints (3) actual number of known offenses and (4) offenses cleared by arrest. The figures

are confined to: criminal homicide; rape; robbery; aggravated assault; burglary; larceny, and auto theft. Complaints which when investigated prove to be groundless are excluded.

In addition the FBI obtains reports on the number of persons released without formal charge, the number charged and the number found guilty. These reports cover the seven major offenses listed above as well as a number of less frequent offenses such as forgery and counterfeiting or less serious offenses such as drunkenness and traffic violations. The Identification Division (FBI) also tabulates data from the fingerprint arrest records received.

In the records described above no distinction is made between juveniles and adults. In 1926 the Children's Bureau began the collection of data on delinquents handled by juvenile courts. Data currently collected cover unofficial as well as official cases. Classifications by age, sex and disposition of the case are obtained. Originally, information was obtained directly from the courts; it is now collected from cooperating state agencies which in turn collect records from the individual courts.

What is "crime"?

One of the chief difficulties encountered in the interpretation of crime statistics is the looseness with which the term "crime" is used. Frequently we do not distinguish whether we are talking about "cases," numbers of offenses, or numbers of persons involved or apprehended. Apart from the difficulty of agreement on basic concepts, there are certain difficulties inherent in the nature of the statistics and the processes of their collection which tend to limit their usefulness and comparability for some purposes.

States differ in their laws and customs. Some states permit gambling, some have prohibition, etc. Although there is universal recognition of a distinction between juvenile and adult crime, there is no universally accepted age at which a "child" becomes an "adult." State laws show considerable variation in the ages over which juvenile courts and adult courts have original jurisdiction. In Washington, D. C. the upper juvenile court age is under 18 years. Arkansas, California and Iowa

have the highest age limits, under 21 years. At the other extreme are Connecticut, Georgia, Kansas, New Jersey, New York, North Carolina and Vermont at under 16 years. In many states the age at which primary jurisdiction is under the adult criminal courts depends on the nature of the offense; murder, for example, is more likely to be under the jurisdiction of criminal courts.

Systems of organization for law enforcement differ among localities. Some are better equipped than others with special public and private agencies dealing with both juveniles and adults. City and county police (including sheriffs) outnumber state police 11 to 1. In turn, these three combined outnumber the FBI 20 to 1. These are supplemented by privately employed guards and nightwatchmen, railroad police, hotel and store detectives, insurance company investigators, and other special deputies. There are also the truant officers of the educational system, park police, game wardens, juvenile and adult probation officers, city and county welfare agents, guidance clinic staffs, and staff members of numerous private social service agencies. At the Federal level there are customs, immigration and tax enforcement officials. There are local, state and federal systems of prosecuting attorneys; municipal, county, state and federal courts; and local jails and detention homes, training schools, reformatories and prisons.

With this complex maze of decentralized but inter-related enforcement agencies it is small wonder that conflicting statements based on direct comparisons of statistics sometimes occur. Crime statistics inevitably reflect the combined activity of enforcement agencies and criminals. The number of traffic violations, for example, are influenced by "safety campaigns." In addition crime rates reflect economic conditions in the community such as the degree of urbanization, industrialization, employment, income and volume of business activity.* Thus the efficiency of police or other enforcement agencies cannot be measured merely by the numbers of offenders apprehended, even when these numbers are reported accurately.

Subjective influences prevail

In many cases "she loves me, she loves me not" decisions are involved in the process of reporting. A police officer, for example, is called upon to exercise his discretion in determining whether a crime has in fact been committed or whether a complaint, upon investigation, is proven false or baseless. In so doing every motive of personal interest is on the side of determining that after all no crime was committed. He may have to decide whether a broken store window is

an accident, a disturbance of the peace, malicious destruction of property or an attempted burglary. Crimes are reported by the location in which the violation occurred. The mobility provided by the automobile often makes this determination difficult. This is not an insurmountable problem, but it does complicate the reporting process and may give rise to duplications or omissions.

Court dispositions and institutional inmate populations are influenced by variations in the severity of judges. Also, differences in local offense definitions often make strictly comparable classifications impossible. Duplications often occur even when names are recorded. This is particularly true when records of two or more agencies are combined to obtain a measure of total crime.

Changes from year to year in the laws or customs of a locality may invalidate time comparisons for certain years. Among such changes are changes in laws relating to juvenile court ages, prohibition, traffic laws, and laws giving Federal agents and courts jurisdiction over such offenses as kidnaping or driving a stolen automobile over state lines. Generally speaking, difficulties encountered in year to year comparisons for a given jurisdiction are less serious than those encountered in making comparisons between localities. Most series presenting crime for the United States as a whole are subject to changes from year to year in the number of localities reporting. While this difficulty is to some extent reduced by obtaining a rate for the total population reporting, more refined techniques such as the use of link relatives for identical reporting units or sampling procedures would be preferable.

FBI promotes uniformity

During the past two decades some progress has been made toward the solution of these problems. The Federal Bureau of Investigation in cooperation with the Chiefs of Police has promoted uniform reporting through the publication and distribution of its "Manual of Police Records" and the "Uniform Crime Reporting Handbook." The FBI's efforts in this direction are doubtless aided by its fingerprint identification service.

The Children's Bureau has fostered the establishment of central state agencies to coordinate and unify records of local agencies and juvenile courts. Reports from the central agencies to the Bureau are summarized in an annual report. The National Conference of Commissioners on Uniform State Legislation works continuously toward the adoption of uniform age limits and similar features. Although much has been done to eliminate some of the weaknesses observed by the National Commission on Law Observance and Enforcement in its "Report on Criminal Statistics" (Wickersham Commission, 1931), we are still a long way from complete reliability and comparability.

*An analysis of these factors was made by the author in *Economic Factors in Michigan Delinquency*, Columbia University Press, 1944, and "Wartime Increases in Michigan Delinquency", *American Sociological Review*, August, 1945.

The Statistical Program of Iowa State College

by JOSEPH C. DODSON

Statistical Laboratory, Iowa State College

In the statistical program of Iowa State College there are five principal branches of activity. These are:

The Statistical Laboratory.

The Department of Statistics.

The Statistical Section of the Iowa Agricultural Experiment Station.

Cooperation with industrial and commercial concerns.

Cooperation with governmental agencies.

These activities are separated in theory more than in practice. Actually, they are closely integrated. The same person, for example, fills the positions of director of the Laboratory, head of the Department, and head of the Statistical Section of the Agricultural Experiment Station. Around the College all phases of statistical work are generally regarded as part of the "Statistical Laboratory." This is not strictly true in the sense of organizational framework, but it is a convenient attitude which tends to emphasize coordination.

A brief glance at the history of statistical activities in the College indicates the growing emphasis on the subject. Statistical methods had been used before in both research and teaching, but it was not until 1915 that the first formal course in statistics was offered. In 1924 a group of faculty research workers from various departments held weekly meetings to study the relatively new concept of multiple regression. These meetings were led by Henry A. Wallace, an Iowa State graduate who was keenly interested in scientific research, Dr. Charles F. Sarle, then stationed in Des Moines with the Department of Agriculture, and Professor George W. Snedecor, then of the College's mathematics staff. Interest in statistics was much increased on the campus as a result. The demand for statistical help grew rapidly, and in 1927 the Mathematics Statistical Service was set up under the direction of Professor Snedecor, who has been interested in statistics since he joined the staff in 1913.

The Statistical Laboratory, also headed by Professor Snedecor, was organized in 1933. Its purpose was to conduct research and provide consulting and computing services to other departments of the College. Dr. A. E. Brandt and Professor Gertrude Cox (now director of the Institute of Statistics of the University of North Carolina) were other members of the staff.

An important factor in the Laboratory's growth was the 1938 agreement with the Bureau of Agricultural Economics for cooperative research in statistical problems of mutual interest. The staff was about doubled to carry on this additional research. In later years the

Bureau of the Census and the Weather Bureau have also arranged cooperative projects with the Laboratory.

From 1915 until 1947 most of the teaching of statistics was carried on in the Department of Mathematics. A few other departments, such as Economics and Vocational Education, offered courses with statistical emphasis in their fields. Master's and doctor's degrees with majors in mathematical statistics were offered by the Department of Mathematics.

In 1947 the College established the Department of Statistics, in which were grouped virtually all of the statistics courses formerly offered by other departments plus a number of additional courses. Establishment of the department was recognition by the College of the need of improved facilities for training statisticians. For several years a shortage of qualified statisticians had been evident—a shortage which was emphasized in the recent report of the Committee on Applied Mathematical Statistics of the National Research Council. Iowa State has been offering statistical education for many years, but not on a scale to meet the demand for workers. Under the new setup the educational facilities have been substantially expanded. The operation and functions of the various branches are described below.

Statistical Laboratory

The Laboratory is something of a clearing house for all the statistical activities in the College. Its own particular functions, however, might be classified as (a) research and (b) service. The various research projects are usually thought of as dealing either with statistical theory, experimental design, or survey sampling, or combinations of these. Actually, of course, research results are made available in reports to the participating agencies and in published articles.

Consulting and computing are the two chief forms of service work. Statistical methods are used extensively in many departments of the College, and members of the Laboratory staff are called on to advise in such use. Outside agencies may also seek assistance from the Laboratory with their statistical problems. The computing section provides computing service to other departments or agencies. It is equipped with modern tabulating machines as well as calculating machines. The Laboratory is responsible for the assignment and supervision of all machines on the campus.

Department of Statistics

The Department of Statistics is a part of the Division

of Science and is responsible to the dean of that Division. Its function is to provide instruction in statistics. To carry out that function it offers a comprehensive program of coursework, designed to turn out students well trained in both statistical theory and practice.

The degrees of bachelor of science, master of science, and doctor of philosophy are offered with majors in statistics. The general requirements for these degrees are the same as for other departments. For the bachelor's degree, a minimum of 30 (quarter) credits in statistics is required; for the master's, at least 45 credits of graduate work, 30 in statistics, reading knowledge of one foreign language, and a thesis; for the doctor's, three years of fulltime graduate study at least half of which must be at Iowa State, at least 36 credits each year, a satisfactory reading knowledge of French and German, and a thesis. These are only some of the general regulations.

After several revisions, the statistics curriculum has been established and is in its first year of operation. About 25 courses are being offered within the department. In some cases, courses are being offered jointly with the Departments of Mathematics and Economics.

Statistical Section of the Iowa Agricultural Experiment Station

This branch of the laboratory furthers by consultation the use of correct statistical procedures in the research projects conducted by the Experiment Station. Several members of the statistics staff are on the Station staff, and they consult with project leaders in setting up procedures, and review the statistical parts of the project reports. Projects dealing primarily with statistical theory or methodology are also being conducted under the Station program.

Cooperation with Industrial and Commercial Concerns

Sample surveys conducted by the Laboratory for outside agencies are usually handled as projects of the Industrial Science Research Institute of the College. Such projects are regarded as part of the College's service function and as contributions to research in the field of survey methodology.

Cooperation with Governmental Agencies

The objectives drawn up when the Bureau of Agricultural Economics and the College began their cooperation in 1938 indicate the nature of this joint research:

"The development of efficient experimental methods of sampling individual farms in taking economic surveys of American agriculture;

"The development of efficient experimental designs for field plot experiments that will permit differentiation among genetic, soil, cultural, and direct and indirect meteorological factors as they influence plant growth, yield, and quality of crop production;

"The development of appropriate techniques for discovering interrelations of yields of agriculturally important crops and their meteorological environments;

"The discovery of adequate and valid procedures for the analysis of time series:

"The examination of such available data in the Department of Agriculture and the Agricultural Experiment Stations as may give promise of useful information not yet extracted."

From research funds available to it (such as Bankhead-Jones funds) the BAE provides financing each year for research projects dealing with those objectives. Results of this research have been presented in numerous scientific articles during the 10-year span of the co-operation.

Cooperation with the Bureau of the Census of the Department of Commerce has centered on the nationwide Master Sample, a joint project of that Bureau, the College, and the BAE. Since 1943, when the Master Sample was started, the Census Bureau and the BAE have had personnel at Ames to supervise the assembling of materials, and to keep them up to date.

The Weather Bureau of the Department of Commerce has also worked closely with the Statistical Laboratory for several years in carrying on research in the field of agricultural climatology. Research in fundamental statistical theory is being done under Navy auspices.

The use of statistical methods in research is widely practiced in Iowa State College. The ties between the various statistical branches and other departments on the campus are close. Professor Snedecor has been partly responsible for that cooperation; his experienced counsel on statistical problems has resulted in general recognition of the value of good statistical procedures. But also responsible for the development of the statistical program in the College are such men as J. L. Lush of the Animal Husbandry department, G. F. Sprague of Field Crops, and J. W. Gowen of Genetics, among others. They have a keen appreciation of the value of statistics and great competence in its use, and their influence with students and other staff members has done much to popularize the subject.

Members of the statistics staff are: Raymond J. Jessen, who has been acting head of the department, and acting director of the Laboratory, since Professor Snedecor retired from administrative duties in 1947; George W. Brown, Mary Clem, S. Lee Crump, Dorothy S. Cooke, Joseph C. Dodson, Walter T. Federer, Clifford Hildreth, Paul G. Homeyer, Leonid Hurwicz, Oscar Kempthorne, Arnold J. King, Vincent Lindquist, Robert K. McMillan, Valter V. Monroe, Alexander M. Mood, George W. Morris, Campbell C. Mosier, T. J. Reed, George W. Snedecor, Norman V. Strand, H. C. S. Thom, and Gerhard Tintner.

Selection, Training, and Supervision of Field Interviewers in Marketing Research

by VERGIL D. REED, KATHERINE G. CAPT, and HERBERT A. VITRIOL

I—Selection

The basis of all marketing research is clear, concise, factual information. The function of marketing research is the collection and interpretation of these facts. This information may be acquired by or from government agencies, private industry, or from the general public; it may be primary or secondary in nature depending on the sources from which secured and whether or not it is published. All this information, however, has a common denominator—it has to be collected from original sources by someone before it can be made available for tabulation, analysis and application to the solution of problems.

The source of information may be from different levels—consumer, retailer, wholesaler, manufacturer, or others. The gathering of information is always done by an individual known throughout the profession as a Field Interviewer, except when mail questionnaires are used.

The following pages deal with the selection, training, and supervision of the field interviewer. No greater emphasis need be placed on the function and importance of this individual than to state that the interviewer, acting under a preconceived plan of action, seeks out the source of information, asks the questions and becomes the first person to put the information in writing. Unless the interviewer obtains and records the information accurately, the subsequent efforts of the ablest research analyst will have no significance.

Sources

The sources of good field interviewers are neither ample nor consistent. They vary with the type of survey and the place of investigation. Some principal sources are universities, women's organizations, and key people in the community which includes bankers, chamber of commerce secretaries, ministers, and club officials. Leads also may be obtained from advertising and market research departments of newspapers and from other research organizations.

Letters of application

Only the large and outstanding marketing research organizations receive a regular flow of applications from

people seeking work as field interviewers. Even these have to set up elaborate systems for finding and choosing good interviewers and the end result is still a deficiency of competent, reliable applicants.

Academic sources

The more progressive research organizations have turned to the schools and universities for many of their interviewers and field staffs. They usually recruit interviewers from among the faculty wives and the younger instructors rather than the students, for when a person is being questioned by an interviewer of college age, the tendency is to take the whole procedure too lightly on the part of both the respondent and the interviewer. It must be clearly borne in mind that the interviewer is the only person in marketing research that the general public ever encounters. The research profession must never take the risk of losing the respect of the public through poor choice of interviewers.

The university source is not consistently good because it has not been sufficiently cultivated and because many college towns are atypical and not representative of the market being sampled, thus requiring travel to other cities or towns by any interviewers chosen.

Another academic source for field interviewers is the public school teacher. Teachers often need to increase their income and are willing to do some work which they can fit into their late afternoon or evening hours. Teachers can be developed into good interviewers, especially those living in the smaller towns, because of the respect they enjoy among the townspeople.

Women's organizations and key people in the community

Women's organizations throughout the country are an excellent source of interviewers. Once a satisfactory contact is made, the organizations are a constant source of recruits—sometimes from their own groups but often through recommendations of outside people.

There are many towns in which a systematic coverage of key people will result in recommendations from which a good staff of interviewers can be organized. There is no set order of coverage: sometimes an alert chamber of commerce secretary will cooperate; in other cases an interested banker, a club official, a business

leader, or a minister, depending upon the size and type of town. If these key people are to make intelligent recommendations, they must be given, in every instance, a clear understanding of the kind of person being sought and a comprehensive picture of the purpose and procedures in marketing research.

Newspapers

Many newspapers are wisely taking the research function from under the domination of their promotion departments and are granting it an independent status and specific budget. Marketing research directors will find these newspapers a valuable aid in securing field interviewers since they are likely to have lists of reliable interviewers in their areas.

Other market research organizations

In the earlier days of organized marketing research it was customary for organizations to exchange names and information about interviewers in different cities and market areas. At that time research work was not plentiful and the number of interviewers available was sufficient to handle any surveys that might be planned. Now, when the amount of research work in the field far outstrips the number of good interviewers, the practice of sharing interviewers is, in many cases and many territories, no longer feasible.

Full-time vs. part-time resident interviewers

It is not wholly accurate to say that the trend is toward full-time interviewers, even though many research directors do realize that they must develop at least a framework or cadre of good, full-time interviewers in key markets. Some organizations have already developed such permanent field staffs. On smaller jobs they are interviewers only. On larger jobs they are also supervisors of temporary or part-time interviewers. The permanent staff should be home-office-trained and home-office-conscious. They must also be a true reflection of the calibre of personnel in the entire organization. These people should be chosen on the basis of their ability to interview, and to select, organize, train, and supervise other interviewers. The full-time staff should be given uniform training by the home office and kept fully informed so that their enthusiasm and knowledge can be maintained. They should be kept alert to the newest interviewing techniques and procedures through regularly scheduled contacts with the home office. A loyal, capable skeleton staff of full-time interviewers is necessary for honest, uniform and interested work in the field. It means that all interviewers, permanent or part-time, will be trained under the same system; that instructions will be interpreted uniformly; that respondents will be measured by the same rules by field interviewers filling specific quotas.

Despite the fact that most part-time interviewers in

marketing research are honest and hardworking, objective appraisal of their work will bring to light a number of weaknesses. In the first place, part-time interviewers may represent several research organizations. These organizations frequently send them jobs with conflicting or overlapping deadlines. If the interviewer attempts to do all the work requested, one job will be handled properly only at the expense of another. Sometimes both jobs suffer. If he turns down one job, that research organization must unearth another interviewer in the area or make some changes in the geographic sample. The ability of part-time interviewers is more often judged on the basis of their finished work than on their actual interviewing style or technique. The obvious shortcoming here is that their finished work may be neat and thorough, but their technique in selecting the respondents and asking the questions may be the cause of unintentionally biased answers. Research organizations have attempted to correct these conditions by increasing the number of full-time, properly trained interviewers and sending out people from their home office to act as on-the-job supervisors. Although expensive, these two steps are certainly in the right direction so far as quality of results is concerned.

Another solution rests possibly within the American Marketing Association itself. This group has long pioneered in setting standards for all phases of marketing research. Now the Association might well consider action to protect and maintain these standards as they are attained. While the Association probably could not license interviewers, it could endorse or approve the work of individual interviewers who give satisfactory evidence of meeting and conforming to standards set by it. "Approved" resident interviewers, known to conform to definite standards, would be a real contribution to better research.

Qualifications

A rule-of-thumb to follow in selecting interviewers is to avoid extremes. The person who makes a good interviewer is one whose characteristics strike an average among all the controls usually sought in a national cross-section sample. He (or she) should not be too aggressive nor too backward; he must be free of obvious racial, political, and religious prejudices; and his attitude toward people must always be sympathetic; his appearance must be clean and pleasing.

As marketing research widens its scope, and as its usage increases in more specialized fields, it would appear that a greater diversification of types of interviewers would also become necessary. This does not hold true, however. The major breakdown needed among market interviewers is that between men and women. There are some jobs that can be handled only by women and others that can be handled only by men. Examples

of these jobs often include surveys on highly personal drug products and questionnaires related to facts that people are not likely to discuss freely in "mixed company."

Generally, an interviewer with sufficient poise and presence can handle any survey calling for direct questions and specific answers. The test of an interviewer's ability is the manner in which he handles people rather than his relative amount of knowledge of the specific business being studied.

One exception should be noted. Different interviewers may be needed for industrial and consumer interviewing. Interviewing industrial respondents is quite a different task from interviewing housewives, and often requires a high degree of technical knowledge, as well as a good knowledge of business organization.

Difficulties in interviewing must be anticipated by the research director, the person who draws up the questionnaire, and the person who writes the field instructions. These people must guide the interviewer by clear, precise instructions. With adequate preparation and proper presentation of a questionnaire, the lack of common background between the interviewer and the respondent should never cause any strain or tension.

II—Training

At the stage of planning

Training, like charity, begins at home. The planners in the home office must realize that the concepts and principles of the survey must be kept simple enough to guarantee measurement of the problem. The language of the questionnaire must conform as closely as possible to common usage so that the respondent can grasp the questions he is supposed to answer.

When a questionnaire contains a question which is too complex, the interviewer is forced to change the question. He would do so for two reasons: he needs to maintain rapport with the respondent, and he must obtain the required information. Another interviewer in another city, confronted with the same situation, is also forced to change the question. The two questions originated by the two interviewers, however, may be unlike each other. Thus, the first departure from the original plan of the survey has taken place and in such a way that there is no evidence of its existence.

All too often, the planners of a study or a group of analysts interested in the problem become carried away with the hope of obtaining the answers to all their problems at a single interview. The responsibility rests with the home office for recognizing limitations of these types.

The saturation point is reached early by the interviewer when the quota specifications impose unrealistic

and impractical conditions. In most studies the interviewer is given three, four, or more quota controls, and these are usually selected from such characteristics as age, sex, economic status, race, occupation or employment status. In addition to some or all of these general controls, there is often a need to set up eligibility requirements for the specific survey; that is, the respondent must have used a certain type of product.

As more controls are needed, it is essential that the limitations placed upon the interviewer be recognized when specifying deadlines and production rates for the job. Dangerous practices may emerge: (1) Liberty is taken with the control quotas (a "C" family may look like a "D", if "D" is needed); or, (2) an honest job may be done without adequate compensation in the latter case.

The provision of adequate tools by the home office, then, may be considered the first step in the direction of training field interviewers.

Training the interviewers

While orienting new interviewers is essential, there are other types of training necessary. The process of learning continues and it should not be permitted to do so unaided. Fresh stimulation is needed by interviewers in order that the learning process may develop along the lines that will prove conducive to good interviewing.

There is a keener need for training interviewers because, when an interviewer works, he is farther removed from supervision than is true of most workers. He is faced with the necessity of selling himself to the respondent within a very few minutes. In order to do this effectively, the interviewer must be well grounded in the general principles and techniques of interviewing, as well as in the instructions and procedures for that particular survey—in other words, he must have been trained.

It is very difficult to maintain interest in a job if the person does not have sufficient opportunity to participate in group discussions. Such discussions provide a means for talking things over and exchanging ideas. It is desirable to have frequent meetings with the technical staff, field supervisors and field interviewers present. When time and costs do not permit this kind of operation, however, the important thing to remember is that other methods can be devised which will assist in teaching the interviewer and in sustaining interest and enthusiasm.

Some of the essential points to cover in a training manual are:

1. *The sample:* A simple explanation of how samples are derived from basic population and marketing data would be interesting "news" to many interviewers. Few of them have been told why they are given specific individuals, areas, or quotas, and what they

represent. The necessity for adhering closely to the instructions should be explained and emphasized by describing some of the biases arising from over-interviewing or under-interviewing in certain age groups, or income or rental groups. The idea of having a representative sample of the market must be conveyed to the interviewer because, in most surveys, he is your sampler.

2. *Selection of respondents:* The interviewer actually selects the respondent in most market studies, despite the fact that he may be following rigidly the quota controls established. The importance of this responsibility must be stressed, and the interviewer must be made to understand the need for objectivity in the selection process. Attention should be focused on the undesirability of interviewing friends and relatives, and examples should be given which show the dangers of this practice.
3. *Judging economic class:* Ephemeral at best, the term "economic class" offers a real problem to the field interviewer and to the technical analyst as well. In all cases, economic class requires a subjective judgment on the part of the interviewer and is therefore open to all the criticisms leveled against that type of judgment. The manual provides a real chance to explain the factors which the technical staff feels are the best ones by which to judge the economic status of an individual. Normally, rental paid and income are two of the factors used.
4. *Approach and manner of interview:* Practical and replete examples of approaches which the interviewer may actually use will help to give this early stage of the interview its proper weight in his mind. A manner free from prejudices, either of a political or religious nature, will be of great value to the interviewer.
5. *Question phrasing and order:* Since both the order and the phrasing of questions should be followed explicitly, the full importance of this rule should be explained in a general manual, with special emphasis on the biases arising from leading questions. Extended treatment on the value of objective probing when a respondent is slow to give concrete answers, together with examples of both right and wrong probes, would, of course, be an intrinsic part of such a section.
6. *"I don't know" answers:* The two types of don't know answers should be explained—the real "don't know" and the lazy "don't know." An interviewer should be taught how to distinguish between them and he should learn about their existence when he is being trained for the first time. Similarly, "don't know" and "no preference" answers are frequently confused and interviewers must guard against falling into that trap. Correct interpretation and recording of these points

are tremendously important. A training manual can point out these distinctions before the interviewer acquires bad habits.

7. *Verbatim responses, voluntary comments, etc.:* Some surveys call for "free-hand" answers or "reasons why" questions, which are needed in verbatim form, and other surveys need only voluntary comments. The interviewer must know what these terms mean and how to distinguish between them and his manual or handbook should tell him.
8. *Checking questionnaires immediately after an interview:* It is not unusual to find an interviewer who can conduct a splendid interview but is careless about recording the facts on the questionnaire. In such cases questionnaires have to be disqualified. Many times a quick review of the questionnaires at the time of the interview would have caught the error.
9. *Other technical points:* A training manual should go into many more cautions and explanation, all of which cannot be pointed out individually. There are the cautions against interviewing by telephone on a personal interview survey, those against interviewing respondents in a group, against the type of entries that cause the coders trouble, plus explanations on how to use demonstration material.
10. *Administrative section:* One section of the training manual should be devoted to the bookkeeping aspects of the job. This would include, of course, how to keep time records, how to make out expense forms, use of identification cards, use of maps, receipt and disposal of supplies.
11. *Job reports and questions during the conduct of a survey:* One of the most difficult problems to overcome is the hesitance of interviewers to ask questions of the home office when there is doubt about the correct procedure to follow or the meaning of a statement. The need to break down this barrier is obvious, but the question has been how to break it down. Personal discussion, well handled by the home office staff, is perhaps the best method. Since it is not always possible to see the field supervisors and interviewers frequently, this method should not be relied upon solely. The manual can stress the importance of questions from the field and thus prepare the interviewer for future requests and invitations to him for this type of participation. A stimulation to the interviewer for making suggestions is to see that some of his comments and suggestions have been incorporated into the instructions covering later surveys.

Instructions for individual surveys

Providing a manual along the lines of the subjects discussed above means that instructions for a specific survey need refer only to certain points in the general

manual, simply as reminders to the interviewer. Then, the additional points that need clarification for each survey conducted stand out as different or new procedures to be followed. Too often interviewers assume they know how to conduct all surveys, and some of this may well be due to instructions which appear routine. The instructions for individual surveys are of two kinds—administrative and technical. There seems to be an advantage in presenting instructions covering the administrative details in one document (usually a single sheet or at the most two or three) and the technical instructions for making the interview in another document.

Technical instructions to the interviewer describing who is to fill out the questionnaire and how to conduct the interview are essential. These instructions should contain all information on procedures for the particular survey and are generally more understandable if divided into two sections, "General" and "Instructions for Filling Out the Questionnaire." The general section should include the purpose and scope of the survey, where and whom to interview (the people who are eligible and those who are not), the nature and characteristics of the sample, the number of call-backs to be made where area sampling methods are being used, and any other details of a similar nature which are pertinent to the survey.

These instructions should be designed so as to clarify and emphasize the instructions appearing on the questionnaire itself and for expansion or clarification of definitions and classifications to be used in recording. Reminders of probing and verbatim response should be added where needed.

Other training aids

Where considered advisable there may be *illustrative cases* prepared which stimulate the conditions of an actual interview. If some such device is used, the important things to remember are: (1) The interviewer must be told how to use it as a training aid, and (2) if the properly filled questionnaire accompanying the narrative is not absolutely correct, more harm is done by having the case than by not having one.

Editing checks, placed at the end of the instructions, have been found useful in many types of surveys, especially those which contain a large number of "chain questions."

Newsletters or house organs of various sorts serve as a means of sustaining interest among interviewers and also of presenting to them new ideas, new procedures or reviewing old problems.

Outside of a workable questionnaire and set of instructions, perhaps the most important single procedure for training an interviewer is to let him know his per-

formance record after each job. This practice gives the interviewer a chance to correct his weaknesses and turn in better work. He must also be told the *types* of mistakes he made and, if at all possible, the frequency with which he made them. Without a system of error ratings for interviewers, much of the other training loses a great deal of its value.

III—Supervision

Personal supervision of interviewers by the field supervisors, including proper assignments, spot checking, and assistance where needed are assumed. Some of the supplements to and methods of personal supervision follow.

Validation

Validation studies, whether by mail or by personal interview, point toward weak spots but do not wholly answer the problem. Data already collected on this subject* have shown the existence of the problem and can serve as guides to further ways to study it.

Supervisors, whether on the staff of the home office or serving independently as the supervisor of a crew of interviewers, should validate the work of the interviewers at frequent intervals. In evaluating results of validation studies, patterns of differences do become apparent and these can be related to the work of an individual interviewer.

The new interviewer

The new interviewer should be trained through study and discussion and should also be permitted to observe the supervisor conducting interviews. After a few interviews by the supervisor, the trainee should try a few practice interviews in the presence of the supervisor before attempting interviewing alone. At the close of each practice interview, the supervisor should then go over it with the trainee, correcting any mistakes in recording, pointing out ill-chosen interviewing techniques and suggesting needed improvements in approach or manner of asking questions.

Experienced interviewers

Similar procedures should be followed from time to time with experienced interviewers. Test calls by the supervisor will provide him with useful hints on the points to emphasize especially at the next training session of the interviewing staff.

New surveys

When a new survey is started, both experienced and new interviewers should attend a training class. Detailed discussion of ways of making these classes effective cannot be covered here, but two things may be briefly stated.

* Gladys L. Palmer, "The Reliability of Response in Labor-Market Inquiries", Technical Paper No. 22, Bureau of the Budget, 1942.

"Factors in the Variability of Response in Enumerative Studies", *Journal of the American Statistical Association*, Vol. 38, pp. 143-152.

The teacher should always be prepared to teach the subject, and stimulating material should be provided. Practice interviews should constitute part of the training and supervision program.

In addition to having the first few interviews reviewed early, it is wise to have all of the first day's work of all interviewers turned in to the supervisor immediately. In this way completeness and consistency can be checked at the beginning of the survey.

Need for standards

Marketing research can never be of better quality than are the interviewers who gather the facts from respondents. No finished product is better than the qual-

ity of the raw materials and the skill of the workmen connected with it. Without well chosen, well trained, accurate, intelligent, and conscientious interviewers, the ablest home office staff with the best conceived plan for a field investigation is futile. Even worse, the "facts" collected by inferior interviewers may be more misleading in making decisions than the lack of such "facts."

There is a real need for cooperative effort among all marketing research organizations directed toward the creation of and adherence to standards of interviewing. Once generally accepted, these minimum standards should govern the selection, training, and supervision of interviewers by all recognized practitioners.

Authority and Reason as Instruments of Coordination in the U. S. CONTINUED FROM PAGE 10

operation—flexibility, morale, and the absence of mental compartments. Such an arrangement should also help to lighten the reporting burdens imposed upon respondents. Finally, it would change and clarify agency functions in a way that is particularly important for our present purpose. Today the task of providing the social and economic information we need is, in many respects, not clearly assigned to anybody. As soon as a focal agency has been developed in each broad field, the task

of providing most of the information will be stated as a set of clear and definite job assignments.

In 1940, the Division of Statistical Standards gave careful consideration to a broad move designed to implement a development along these lines. It is my belief that this move would have been made, had wartime problems not inopportunately intervened. I believe the time is now ripe to reopen this question. I hope the Division of Statistical Standards will again undertake to implement broadly the development of focal agencies.

NEWS CONTINUED FROM PAGE 6

Navy needs personnel in California for scientific research and development program

Implementing its scientific research and development program both geographically and in new fields of endeavor, the Navy Department is currently expanding three comparatively new, permanent laboratories in California. Heretofore, the Navy Department's scientific centers have been concentrated in the eastern and eastern seaboard areas.

Two of the laboratories have been established as the logical outgrowth of programs carried on by universities during the war. The Naval Ordnance Test Station, China Lake (formerly Inyokern), California, 160 miles from Los Angeles, was originally an activity of the California Institute of Technology. Its present program involves research, development and test work with ordnance equipment and explosives. The Navy Electronics Laboratory at San Diego, California, is the outgrowth of work done by the University of California. It is concerned with research, testing and development of electronic control devices, detection equipment, instrumentation equipment and training aids. The Naval Air Missile Test Center at Point Mugu on the coast of California, 60 miles north of Los Angeles, was established

when the need for an installation became apparent as the result of the Navy Department's activities on guided missiles. The Test Center's activities are concerned with flight and laboratory testing and evaluation of guided missiles and their components.

Each of the establishments has current need for qualified personnel in a variety of scientific fields to staff its laboratories. Recently completed at the Naval Ordnance Test Station is Michelson Laboratory at a cost of \$6,000,000. Many more millions of dollars have been spent in equipment and facilities. Additional construction and facilities are planned for both the Air Missile Test Center and the Electronics Laboratory.

Professional positions are in the career service of the Federal government under Civil Service laws. Examinations are now open in the three scientific establishments in the following professional fields: Chemist, Mathematician, Metallurgist, Meteorologist, Physicist, Statistician, Scientific Research Administrator and Scientific Staff Assistant.

Salaries for most of the positions range from \$3397 to \$9975 per annum. Further information may be obtained from the Navy Department Joint Board of U. S. Civil Service Examiners, 1030 East Green Street, Pasadena 1, California.

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QUESTIONS and ANSWERS

edited by **FREDERICK MOSTELLER**
Harvard University

HOMOGENITY OF SEVERAL SAMPLES

Question 11. Fifteen paired observations are made on each of two variables X, Y giving fifteen pairs of results $X_1, \dots, X_{15}, Y_1, \dots, Y_{15}$. There is a slight positive correlation between the two sets of observations. The ratio

$$R = \sum_{i=1}^{15} X_i / \sum_{i=1}^{15} Y_i$$

is computed.

The experiment is repeated 8 times with different pairs of variables. The X_i, Y_i are of different respective orders of magnitude in each experiment, and there is no correlation between them in any of the experiments. The eight ratios however, seem to be in fairly close agreement. Specifically, they are 1.08, 1.10, 1.13, 1.19, 1.23, 1.24, 1.27, 1.39.

Is there any method for testing whether or not these ratios form a homogeneous set?

Answer. If one were to assume that the joint distribution of the pair X, Y is bivariate normal, then there would be a choice of meanings for the word "homogeneous." For example, one could test whether the distributions differ from set to set only by a common scale factor on X and Y , or one could test whether the means differ from set to set by a common scale factor, assuming the same variances and covariances for each set. Tests can be derived by maximum likelihood methods for any one of these three kinds of homogeneity. Unfortunately, none of these tests appears to be very simple to apply.

A reasonable distribution-free test (not depending on a normality assumption) can be carried out as follows. Calculate X_i/Y_i for each of the pairs in each set. Then order the 120 ratios thus obtained, and split into two groups, the low 60 and the high 60. This split divides the fifteen ratios of each set into two groups. Now calculate chi-square for the distribution of the sets within groups, using expected numbers equal to 7.5. The criterion will be distributed like chi-square with 7 degrees of freedom. The null hypothesis being tested is that the 50% points of the distribution of X_i/Y_i are the same from set to set.

For example, let us consider the data given in Table 10.12, Snedecor, *Statistical Methods*, fourth edition, page 232. The data give birth weights of Poland China pigs in eight litters, with varying litter sizes: 10, 8, 10, 8, 6, 4, 6, 4. Note that since the question refers to the disposition of X/Y , we are in effect dealing with a single variable, as in this example. Further, this example does not restrict us to the same sample size for each sample. Figure 1 shows plotted the birth weights of the individual pigs in the eight litters, and the horizontal line indicates the overall median for all litters. It happens that there are four pigs weighing 2.8 pounds, which is the

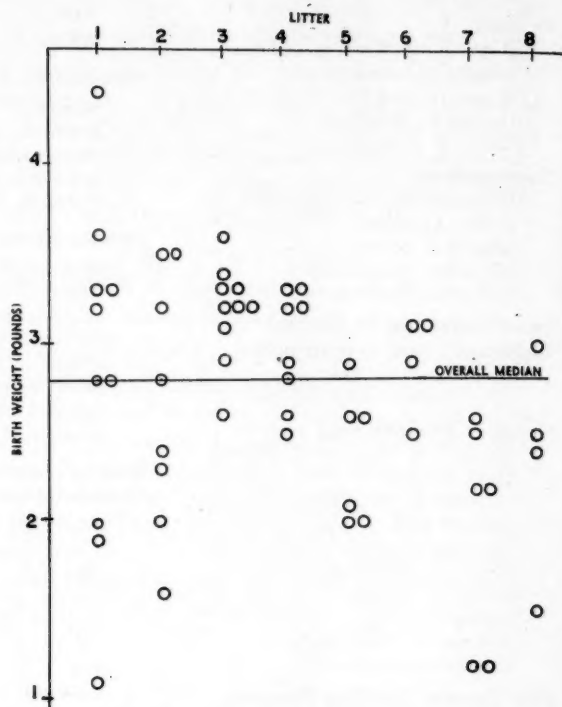


FIGURE 1. Graph of birth weights of Poland China Pigs versus litter number in connection with the example of Question 11.

sample median. Each of these cases will be treated as if half of it lies on one side of the median and half on the other side. A slight approximation has been introduced here because this procedure does not give us exactly 28 on each side of the median, but 29 and 27. Consequently litter 2, for example, has 3.5 cases above the median and 4.5 below the median, with an expected number of 8.2, since there are eight observations in the sample.

Chi-square for this example is then

$$\begin{aligned} \chi^2 &= 2(6-5)^2/5 + 2(3.5-4)^2/4 + 2(9-5)^2/5 + 2(5.5-4)^2/4 + \\ &\quad 2(1-3)^2/3 + 2(3-2)^2/2 + 2(0-3)^2/3 + 2(1-2)^2/2 \\ &= 2/5 + 1/8 + 32/5 + 9/8 + 8/3 + 1 + 6 + 1 = 18.7 \end{aligned}$$

Snedecor's $F_{7,18} = 2.97$ is barely below the 1% level of significance (3.04), and our $\chi^2 = 18.7$ is barely above the 1% level (18.5). In other words the analysis of variance and the chi-square criterion are at almost exactly the same level.

G. W. Brown and A. M. Mood

ACTUARIAL TRAINING

Comments on Question 7. (*American Statistician*, Vol. 2, Feb. 1948, p. 18.) What colleges and universities specifically attempt to prepare students for actuarial work either as graduates or undergraduates?

In publishing Professor Fischer's answer to this question we asked for additional information. The following two communications have been received in answer to our inquiry.

"The Faculty of Commerce of the University of Montreal has under way a complete course specifically intended to prepare students for the examinations of the Actuarial Societies. In the French-speaking Province of Quebec, the name of the institution is "Ecole des Hautes Etudes commerciales de Montreal", named after the similar institution in Paris.

"This special section has been in operation for two years and the first enrolled students will undertake their third year on September next.

"The complete course as far as it is related to the subjects included in the curriculum of associateship examinations is scheduled to last four years because, in addition to the courses directly concerned with the preparation proper, the student is taking most of the regular courses of the Faculty (economics, accounting, industrial and commercial laws, etc.). Conferences related to the matters of the fellowship examinations are planned."

Esdras Minville

VARIANCE OF NUMBER OF MATCHES

Comment on Question 8. (*American Statistician*, Vol. 2, Feb. 1948, p. 18-19).

Question 8 dealt with the chance distribution of the number of correct matches of suits made when a deck of N cards composed of k suits consisting of n cards each is dealt onto a target deck of the same composition. The problem was applied to a question about Rorschach data.

In playing around with matching problems I have discovered that the formula for the variance of the matching distribution is quite simple if all the cards are different, or if there are equal numbers of cards in all suits. This formula does not seem to be widely known. If we define $p=1/k$, which is the probability that the first card dealt is a match, and $q=(k-1)/k$, then for the case under discussion the variance of the number

"The department of mathematics at Hunter College of the City of New York has given the following courses in statistics and actuarial training for undergraduate students for over ten years.

1. Seven courses in elementary and advanced mathematical statistics.
2. Econometrics.
3. Mathematics of Investment.
4. Theory of Probability.
5. Finite Differences.
6. Mathematics of Insurance.
7. Advanced Theory of Life Contingencies.
8. Life Insurance Accounting.

These are in addition to the usual courses in calculus, advanced calculus, etc."

Leo A. Aroian

of hits or matches is given by

$$\sigma_k^2 = Npq \frac{N}{N-1}$$

When N is large, $N/(N-1)$ is approximately unity and the variance of the number of hits is essentially that for the binomial distribution Npq . The above formula may be verified by making the proper substitutions in the formula appearing in the original Question 8. For the problem treated in Question 8 we had 12 cards, $N=12$, 4 suits, $k=4$, 3 cards in each suit, $n=3$. So the variance is $12 \times 1/4 \times 3/4 \times 12/11 = 27/11$ which was the result originally obtained.

It seems to me that this is a useful piece of information because so many matching problems are of the type which this formula fits.

C. Horace Hamilton

NEWS

CONTINUED FROM PAGE 20

IMS announces new Committee on Tabulation

The Institute of Mathematical Statistics has announced the reorganization of its Committee on Tabulation with the following membership:

R. L. Anderson, C. Eisenhart (Chairman), A. M. Mood, F. Mosteller, H. G. Romig, L. E. Simon, and J. W. Tukey.

Committee objectives are three in number, according to the announcement. 1—Preparation of a comprehensive list of new mathematical tables and other aids that will be of value in the development of statistical theory and applications, with evaluation of their priorities. 2—Assembly of an American collection of "Tables for Statisticians" built around mathematical tables and other aids currently available in periodical literature and other sources. 3—Preparation of a list of tables and other aids of such importance in statistical theory and application that they should be included in any modern handbook of tables for the occasional computer.

The following sub-committees and chairmen

have also been announced: Computing Centers, L. E. Simon; Ranks and Runs, A. M. Mood; Serial Correlations, R. L. Anderson; 2x2 Tables, C. Eisenhart; Order Statistics, F. Mosteller; Binomial, Poisson, and Hyper-geometric Distributions, H. G. Romig; Miscellaneous Tables, J. W. Tukey. The first task of the Sub-committee on Computing Centers is to prepare a descriptive article on the computing centers of the United States, stating the types of computing equipment available at each and indicating the types of computations that each center is thus best able to undertake. Its second function is to advise the main Committee on the allocation of specific tabulations among the various computing centers. The objectives of the other sub-committees are those of the parent Committee, limited to their respective fields.

The Committee on Tabulation will welcome advice and suggestions concerning its work and requests that correspondence on specific topics be addressed to the Chairman of the appropriate sub-committee whenever possible.

Double Scales Are Dangerous

by KENNETH W. HAEMER

Time-series presentation frequently poses the problem of comparing the growth of series that differ greatly in magnitude or that are measured in different units. When close comparison is desired, some way must be found to bring the curves together on a single grid.

A double amount scale—a separate vertical scale for each series—is often used as one means of meeting this problem. Employed by persons who clearly understand its limitations, this method is frequently valuable. Used as a method of presentation to the general reader, the double scale technique can become a short cut to confusion, first, because it may show things that it really doesn't show, and second, because it may produce a distorted picture if not used properly.

Chart 1 illustrates a typical candidate for the double-scale treatment. The curves are so far apart that they cannot be compared readily, and to make matters worse, they are so flat that any similarity of action is difficult to detect. The urge to "open up" these curves and to bring them close enough for easy comparison is surely a legitimate one.

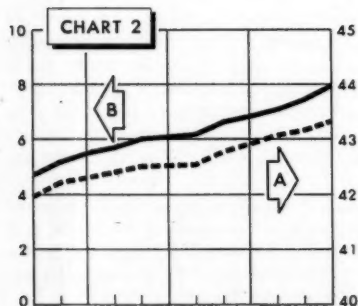
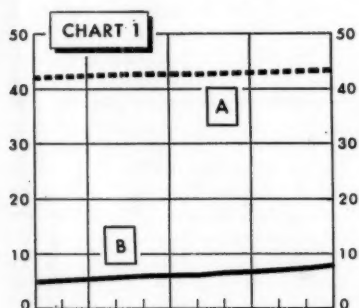


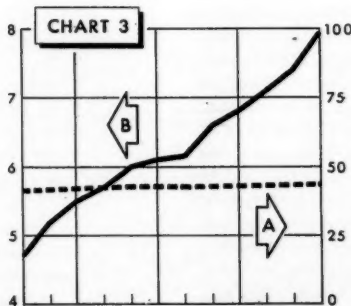
Chart 2 shows one result of succumbing to this urge. At first glance it appears to demonstrate that the growth of both series is the same; but a careful look will show that the curves have been made to fit by manipulation of the scales. Using this method, any two increase trends could be made to take the same general slope. As demonstrated in Chart 3, they could be made not to agree, just as easily and just as convincingly. Neither of these charts shows the true relationship between the growth of the two series, and the reason is that in each case the two zero values do not coincide.

Chart 4 is one correct solution. Both scales begin at zero*, and at the same time the scale intervals have been so selected that the curves start at the same point. This procedure produces the same effect as conversion of both series to simple indexes, and thus compares their relative changes from the point at which they meet.

Numerous other correct scale combinations are possible. For example the scales could be so selected that the curves meet at the middle or at some other point. So long as the zeros coincide, the growth pattern of each series would remain the same as in Chart 4 even though the placement of the curves on the chart would be slightly different.

Of course, the picture in Chart 4 could have been produced by actually

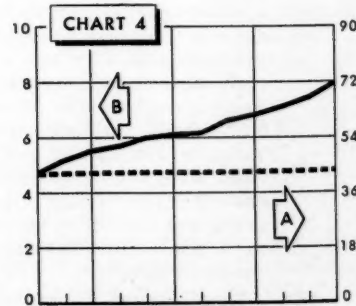
* It is not necessary to have the zero values actually appear on the chart if the scales are so selected that both zeros would coincide if the scales were extended far enough.



converting the data to indexes and plotting them on a chart containing a single index scale. In many cases this would be a safer procedure. However, as a short-hand method of arriving at the same result without computation, the double scale method is frequently useful. It has the added advantage that since absolute-value scales are used instead of the percentage-value scales, ready reference can be made to actual magnitudes.

On the other hand, many readers are confused by the presence of two scales, and either use the wrong one or simply disregard both. Also, the general reader has the disconcerting habit of believing that because one curve is higher than another, it is also larger in magnitude. This leads to all sorts of misconceptions.

To summarize: double-scale charts are likely to be misleading unless the two zero values coincide (either on or off the chart). To insure an accurate comparison of growth the scale intervals should be so chosen that both curves meet at some point. This treatment produces the effect of percentage relatives or simple index numbers with the point of juncture serving as the base point. The principal advantage of this form of presentation is that it is a short-cut method of comparing the relative change of two or more series without computation. It is especially useful for bringing together series that either vary widely in magnitude or are measured in different units and hence cannot be compared conveniently on a chart having only one absolute-amount scale. In general, the double scale treatment should not be used for presenting growth comparisons to the general reader.



NEWS about MEMBERS

- B** Marvin A. Bacon, formerly of the Office of Small Business, Department of Commerce, has joined the Fiscal Division, Bureau of the Budget. Dana M. Barbour of the Bureau of the Budget was on loan for three months to the Commission on the Organization of the Executive Branch of the Federal Government. Vincent J. Brings is Chief Labor Market Analyst, Employment Security Department, State of Washington. W. Randolph Burgess, vice chairman of the National City Bank, New York, and Walter W. Stewart, head of the Institute of Advanced Study at Princeton, have been appointed by Paul G. Hoffman, Director of ECA, as members of his eight-member advisory committee on fiscal and monetary problems.
- C** William H. Cummins of the Social Security Administration has gone to Tokyo to assist General Headquarters of the Far East Command to establish an industry and commodity classification system for the Japanese government.
- E** D. C. Elliott has been with the Cleveland Trust Co. as Economist since October. He succeeds Leonard Ayres as writer of the Cleveland Trust Monthly Bulletin. Lenore A. Epstein, formerly with the Bureau of Labor Statistics, has joined the Bureau of Research and Statistics, Social Security Administration.
- H** George Hausknecht has joined the staff of the Office of the Chief of the Bureau of Agricultural Economics. Henry F. Hebley of the Pittsburgh Coal Co. made a survey of fuel in Poland for the International Bank for Reconstruction and Development.
- J** India G. Johnson is a Statistical Analyst with the 29th Statistical Control Unit, Pacific Air Command, Hickam Field, Honolulu.
- K** Robert L. Kahn is Acting Chief of the Field Division of the Bureau of the Census. Irving Katz, formerly with the Office of the Housing Expediter, has joined the staff of the Strategic Air Command, Management Control Section, Andrews Air Force Base, as an industrial economist.
- L** Stanley Lebergott, formerly with the ILO has joined the Bureau of the Budget to work on national income statistics.
- M** Mary Marquardt has left Detroit University to become Assistant Professor of Statistics, N. Y. State School of Industrial and Labor Relations, Cornell University. Ford M. Milam is a member of the American Occupational Forces in Korea and is acting as adviser to the Agricultural Improvement Services of the South Korean Interim Government. He has been elected vice-president of the Korean Agricultural Scientific Society composed of Korean agriculturists and Americans working with the U. S. Army Military Government. The Agricultural Improvement Service is composed of a series of agricultural experiment stations, Agricultural Colleges and the National Agricultural Extension Service. The experiment stations are doing fundamental agricultural research. Their findings are used by the colleges, and the Extension Service is using the information in its farm training program. Jack Moshman formerly of the University of Tennessee, is now Statistician to the Medical Advisor, United States Atomic Energy Commission, Oak Ridge, Tennessee.
- N** Jesse J. Nicholas is on leave from the Bureau of the Census to serve as Chief, Inventory, Evaluation and Catalog Division, Reparation Section, Supreme Commander for the Allied Powers, Japan.
- P** Rexford Parmelee has become Associate Director of the Clearing Office for Foreign Transactions, Department of Commerce. John Shirer, former Director, has left government service and moved to Arizona. Arthur G. Peterson has been appointed Chief, Division of Statistics, National Economic Board, U. S. Army Military Government in Korea. He writes, "This whole experiment in controlling a national economy is very interesting from a theoretical and practical standpoint. The political uncertainty introduces some unique aspects of national planning."
- "People here, i.e. Koreans, run one year older than Americans, the reason being that the Koreans count the period of gestation as equivalent to counting ages as equal to birthdays instead of years lived after birth." Robert Y. Phillips has been appointed Executive Assistant to the Director of the Bureau of the Census. Robert I. Piper has transferred to the Pacific Telephone and Telegraph Company from the Southern Company to assist in planning and analyzing sampling surveys of wage rates.
- Q** Albert O. Qualley is leaving Lehigh University to take an Assistant Professorship in Mathematics at Drake University.
- R** Winfield Riefler has been appointed Assistant to the Chairman of the Board of Governors of the Federal Reserve System.
- S** Erich Arnold Schultz, formerly with the Chicago Regional Office of the Public Housing Administration and the Manhattan District, Oak Ridge, Tenn., is now Director of the Division of Research and Statistics of the Arizona State Department of Social Security and Welfare. Victor E. Smith is Assistant Professor of Economics at Brown University. George W. Snedecor addressed a joint session of the Biology and Medical Sciences, Industry and Economics, and Social Sciences Sections of the Alabama Academy of Sciences on the subject: "Increasing the Efficiency of Sampling Investigations" at a recent meeting. Peyton Stapp took leave from the Bureau of the Budget to serve as Acting Deputy Director of the Statistical Office of the United Nations in establishing the statistical services for the Economic Commission for Asia and the Far East. Oscar F. Stewart is Supervisor of Analysis of the Parts and Accessories Sales Department, Ford Motor Company, Detroit, Michigan. Willard E. Swenson has been named statistician of Airtemp-Division, Chrysler Corp., at Dayton, Ohio.
- V** J. Frederick Verigan has become Director of Quality-Control for the Weatherhead Company, Cleveland, Ohio.
- W** Ralph J. Watkins, research economist of Dun & Bradstreet, Inc., has been appointed director of the new plans and programs division of the National Security Resources Board, a key post in planning for the mobilization of industry in the U. S. to meet any emergency.
- Z** Joseph L. Zarefsky is the new Director of the Research Bureau of the Community Council of Houston, Texas.

CHAPTER NOTES

ALBANY

Officers for 1948-1949 are: President—Ethel Metzendorff; Vice President—Max S. Weinstein; Secretary—Treasurer—Murray Dorkin; Directors—William E. Bair, Leonard Requa.

CENTRAL NEW JERSEY

Officers for 1948-1949 are as follows: President—Frederick F. Stephan; Vice President—Harold Gulliksen; Secretary—Treasurer—William Netschert, Jr.; Assistant Secretary—Mary McKallen.

CHICAGO

George Katona, Program Director of the Survey Research Center, University of Michigan, addressed the April meeting on "Survey of Consumer Finances—Their Purpose and Method." Burleigh B. Gardner, Executive Director of Social Research, Inc., discussed "New Methods in Research on Executive Personality" at the May meeting.

CLEVELAND

The 23rd Annual Meeting of the Chapter was addressed by Dr. W. Edwards Deming, Chief Economist, Bureau of the Budget, on "The Collection of Statistical Information for Sampling".

CONNECTICUT

The Connecticut Chapter met jointly with the American Society for

Quality Control on May 10 to hear L. H. C. Tippet speak on "An Englishman Looks at Quality Control". Mr. Tippet, Statistician for the British Cotton Industry Association, is in the U. S. for a series of lectures.

"Accuracy of Modern Polling Techniques in Making Election Forecasts" was the subject of George Gallup, Director, American Institute of Public Opinion, in April.

DENVER

"Prospective Enrollment Trends in Elementary and Secondary Schools in Denver" was the subject of F. L. Carmichael, Director, Denver University Bureau of Business and Social Research, at the April meeting.

NEW YORK

H. A. Freeman of the Massachusetts Institute of Technology spoke at the April meeting of the Statistical Techniques Division on "Applications of Sequential Analysis".

The Metropolitan Area Statistics Division held its first group discussion meeting on May 12, under the direction of George Garvy. David Glickman of the Port of N. Y. Authority spoke on "Future Volume of Commerce through the Port of New York" and Jay Gould of the Econometric Institute, Inc., on "Methods of Allocating National Income Data by Small Areas".

NORTH CAROLINA

R. C. Bose spoke on "Experimental Designs" at the March meeting. A group discussion was held concerning the application of incomplete block designs to other than agricultural experiments and concerning the chance elements which need to be included in the estimation of random error.

PHILADELPHIA

Homer Jones of the Staff of the Committee for Economic Development spoke on "Saving and Investment" at the April meeting; and Louis J. Paradiso, Director of Research for the Econometric Institute on "Factors Influencing the Economic Outlook during the Balance of 1948" at the May meeting. This is the third year that Mr. Paradiso was invited to address the final meeting of the Chapter.

Officers for 1948-1949 elected at the May meeting are: President—Douglass E. Burdick, University of Pennsylvania; Vice President—Benedict Saurine, Sun Oil Co.; Secretary-Treasurer—Kenneth M. Snader, Federal Reserve Bank of Philadelphia.

ST. LOUIS

Edward B. Olds is acting District Representative of the newly chartered Chapter.

WANTED: Statistician

Graduate of accredited college or university with major in Statistics or higher mathematics. At least two years' experience (within past five years) in Public Health Statistics. Salary range \$225-\$325 per month with excellent opportunity for promotion. Liberal retirement privileges.

Write State Health Officer, P. O. Box 210,

Jacksonville, Florida.

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